

longed ; at any rate it would have been putting to the test the geographical characters of the species, and this arrangement can only be made by an American acquainted with the branches and creeks of the different rivers.

Mr. Lea uses this test for the European species, and reduces all the *Anodons* to a single species, but believes that a very little stream in America affords at least one, and often many, distinct species of these animals!—J. E. G.

## PROCEEDINGS OF LEARNED SOCIETIES.

### ZOOLOGICAL SOCIETY.

December 10, 1850.—Prof. Owen, V.P., F.R.S., in the Chair.

OBSERVATIONS ON THE DESTRUCTIVE SPECIES OF DIPTEROUS INSECTS KNOWN IN AFRICA UNDER THE NAMES OF THE TSETSE, ZIMB, AND TSALTSALYA, AND ON THEIR SUPPOSED CONNEXION WITH THE FOURTH PLAGUE OF EGYPT. BY J. O. WESTWOOD, F.L.S., PRES. ENT. SOC. ETC.

The species of insects which attack the larger of our domestic quadrupeds may be divided into two chief classes ; first, those which do so in order to obtain a supply of food for their own support ; and second, those which do so with the object of depositing their eggs in such a position, that the larvæ, when hatched from them, will be certain of finding a proper supply of food derived from some part of the animal, either external or internal.

The insects composing the first of these two classes require for the performance of their dreaded functions an organization of the parts of the mouth especially fitting them to pierce the skins and hides of the quadrupeds upon the blood of which they subsist, and we accordingly find that it is precisely these insects which have the mouth-organs most fully developed in the different families to which they respectively belong. The *Stomoxys calcitrans*, and especially the different species of *Tabanus*, are pre-eminent in this respect ; and the formidable array of lancets in the mouth of one of the latter insects is not to be met with elsewhere among the whole of the flies composing the order Diptera, to which they belong. The effects of the attacks of these insects upon the horse are perceived by the drops of blood which flow from the orifices caused by their bites, and sometimes these wounds are so numerous, that the beasts “are all in a gore of blood.” A still smaller species, named by Linnæus the *Culex equinus*, also infests the horse in infinite numbers, running under the mane and amongst the hair, and piercing the skin to suck their blood. This insect, although given by Linnæus as a *Culex*, appears from his description to belong to the genus *Simulium*, to which genus also belongs an insect of fearful note, which attacks the horned cattle in Servia and the Bannat, penetrating the generative

organs, nose, ears, &c. of these animals, and by its poisonous bite destroying them in a few hours. A species of the same genus of minute *Tipulidæ* is common in marshy districts in England, and I have often experienced its attacks, which have resulted in the raising of a tumour on the part of the flesh which has been attacked, attended by a considerable amount of local inflammation; and hence we may readily believe the well-authenticated effects produced upon the cattle above described. There are various other insects which attack the horse and ox, such as the *Hippoboscæ*, various species of ticks, *Anthomyiæ*, &c.; and if these do not, from their smaller size, cause a discharge of blood like the large *Tabanidæ*, it is certain that the irritation which they produce not only by their presence upon the skin, but also by the sharpness of their bite, must be very irritating to the quadrupeds which they infest.

The insects which do not themselves feed upon our cattle, but simply infest them for the purpose of depositing their eggs in some convenient place or other upon their bodies, are in no instance that I recollect provided with an increased development of the mouth organs; on the contrary, the *Æstridæ* are either entirely destitute of a mouth, or have only very small rudiments of some of the ordinary parts of the mouth, so as to be entirely unfitted for biting or wounding cattle. The effects however which some of these species produce are as annoying as those caused by the bites of the *Tabani*. The female fly of the common horse bot, *Æstrus Equi*, it is true, instils no dread into the horse round which she is intently engaged in flying; depositing her eggs here and there in particular spots where the horse is certain to lick the hairs, by which means the eggs are introduced into the mouth and pass into the stomach. So little indeed is the horse affected by the presence of this insect, that I have often stood close to one round which the *Æstrus Equi* has been flying, until the latter has come within reach of my hand, when I have caught it without trouble. Another species, *Æstrus hæmorrhoidalis*, is however much more troublesome; depositing her eggs on the lips of the horse, and producing in her endeavours to effect this such an excessive titillation, as to cause great uneasiness to the horse, which tosses its head about to drive off its enemy, gallops about, and as a last resource takes refuge in some neighbouring water, where the *Æstri* never follow it. The same kind of effect is also produced in rein deer by the *Æstrus Tarandi*\*, and in oxen by another species of *Æstrus*, *Æst. Bovis*, respecting which however much difference of opinion has arisen. At certain seasons, the whole terrified herd, with their tails in the air, or turned upon their backs, or stiffly stretched out in the direction of the spine, gallop about the pastures, finding no rest till they also get into the water. This *Æstrus* is asserted by some writers to make a strong humming noise, and hence it has been supposed that the herd of cattle are alarmed at the noise; but this must surely be an incor-

\* At the present time (April 1851) some of the rein deer in the Gardens of the Society, which were imported last autumn from Lapland, are infected to a remarkable extent with the tumours of this species; there must, I think, be from fifty to a hundred tumours on one of these animals.

rect conjecture, as the *Æstri*, if they make any hum at all, are far outstripped in this respect by many other insects which instil no dread into oxen. Neither are they alarmed in consequence of being subjected to the same kind of attack upon so sensitive a part as the lips, as is the case with the horses attacked by *Æstrus hæmorrhoidalis*. It is however asserted by some writers, that the dread is produced by the pain inflicted by the *Æstrus* in depositing her eggs, her ovipositor being represented as constructed like an auger or gimlet, only having several longer points it can wound with more effect. When it is stated, however, that the female *Æstrus Bovis* does not occupy more than a few seconds in depositing each egg, we may fairly doubt whether, with her long, fleshy, tubular ovipositor, she has been able to pierce the hide of an ox; or whether, as Mr. Bracy Clark suggests, she only makes use of this long instrument to thrust the egg down to the surface of the skin, which she does not pierce, but only glues its eggs to it, the young larvæ when hatched burrowing into the flesh. If this be the case, the act of oviposition must be unattended with pain, as in the case of the deposition of the eggs of *Æstrus Equi*, and we must search for the cause of the alarm of the herd, either in an instinctive knowledge that a certain insect flying around them is the parent of a grub which at a future time will be a torment to them, or in the attacks of some other insect; and I confess that I am inclined to consider that Virgil's beautiful description of the annoyance caused by

“ Myriads of insects fluttering in the gloom,  
(*Æstrus* in Greece, *Asilus* named at Rome,)  
Fierce and of cruel hum ”—

has a *Tabanus* rather than an *Æstrus* for its origin.

The larva of the *Æstrus Equi* resides beneath the skin of the back of the ox, causing large tumours, and having the extremity of its body constantly placed at the orifice of the wound, where it was introduced as an egg, or introduced itself as a grub, the openings of its respiratory apparatus being placed at that part of the body.

These introductory remarks on the different modes in which insects attack our horses and oxen, and the different effects which they produce, will enable us the better to estimate the effects produced by an insect, or several species of insects, of tropical Africa upon the horses of travellers who have lately returned from that part of the world, where their enterprising researches have been rewarded by the discovery of the great central lake Tchad. Captain Frank Vardon, a gentleman who has travelled far in the interior of Africa, has placed in my hands some fragments of Dipterous insects which attacked his horses, causing the death of one of them. The following is an extract from his note to me in reply to my inquiry as to the mode of its attack:—

“ 33 Oxford Terrace, Hyde Park, May 1850.

“ DEAR SIR,—I had always heard that the fly of South Africa so destructive to cattle was a large gad-fly, the size of a bee or hornet. This is quite erroneous: it is not very much larger than the common house-fly, but a longer and more ‘rakish’-looking insect, and easily distinguished by the transverse black bars on its body.

“I fancy it is not met with south of the Tropic of Capricorn. It is usually found on hills, plains being free from it. I have ridden up a hill and found the Sêtsé increasing at every step, till at last forty or fifty would be on my horse at once. The specimens you saw cost me one of the best in my stud. He was stung by some ten or a dozen of them, and died in twenty days. I myself have been bitten by the Sêtsé; you would almost fancy it was a flea biting you. Some parts of South Africa are, I should say, rendered inaccessible by the presence of this pest; I mean of course to a man who travels in the usual way, with his oxen and horses.

“How far the Sêtsé extends in the interior is of course as yet unknown, but I have certain information as to its being 200 miles north of the ‘Great Lake’ recently discovered by my friends, Messrs. Livingstone, Oswell and Murray.

“Yours faithfully,

“FRANK VARDON.”

“J. O. Westwood, Esq.”

The various specimens forwarded to me by Captain Vardon have enabled me to determine that the insect is a new species of Wiedemann’s genus *Glossina*, which may be thus characterized:—

*GLOSSINA MORSITANS*, Westw.

*Luteo-albida, thoracis dorso subcastaneo, griseo subtomentoso, vittis quatuor longitudinalibus in medio interruptis nigris, scutelli apice punctis duobus parvis fuscis; abdomine pallide lutescenti, segmento basali utrinque macula parva laterali nigra, singulo segmentorum quatuor proximorum ad basin fascia nigricanti, in medio interrupta, notatis; alis parum infumatis.*

Long. corp. lin. 5; expans. alar. lin.  $8\frac{1}{2}$ .

The head is of a dirty buff colour, narrower than the thorax, with large eyes; the epistoma is paler coloured and clothed with whitish hairs; the proboscis is rather longer than the height of the head; it consists of a slender, horny seta or compound bristle, chestnut-coloured in its chief length, but dilated at the base into a large oval bulbous horny lobe, and upon maceration I was enabled to withdraw from the upper side of the seta (which is consequently grooved), two very delicate styles as long as the proboscis; the sides of this instrument are defended by a pair of elongated, slender setose palpi, as long as the proboscis itself; these are concave on the inside and blackish at the tips, and the setæ with which they are clothed are also black, as well as the branched setæ with which the arista of the antennæ is furnished; the outer surface of the arista itself, under a powerful microscope, is evidently villose. The antennæ are inserted in a depressed obconic space between the eyes, rounded above, and there are two dark spots on the upper part of the epistoma; the two basal joints of the antennæ are dark in front, and the large third joint is dirty buff-coloured. The thorax is chestnut-red, clothed with a very delicate grey tomentosity and finely punctured; it is impressed across the middle of the dorsum, and is marked with four longitudinal broad

black bars, abbreviated in front and behind, the two central ones being longest in front, and the two lateral ones longest behind; the two former are united in front by a black streak from the front margin. The scutellum is dirty buff, with two dark dots at its extremity, from which, as well as from various dark dots at the sides, arise long black setæ; the halteres are nearly white. The wings are slightly stained with dusky; the veins black, except at the base of the wing, where they are dirty-buff. The legs are dirty-buff, with the outside of the thighs stained with dark brown. The last two joints of the tarsi are black, with large pulvilli. The abdomen is flat, oval in outline, and dirty fulvous buff in colour, clothed above with numerous minute black setæ, which are greatly elongated at the base of the abdomen and the extremity and sides of each segment; the first segment is marked at each side close to the anterior angle with a round black spot, and each of the four following segments has a broad basal fascia of dark brown, interrupted in the middle. The sides and under surface of the thorax are varied with black patches; the abdomen is pale-coloured beneath, with a large terminal oval plate, down the middle of which runs a pale longitudinal line, preceded by two small oblique oval patches, thickly clothed with minute black setæ.

The peculiarities of the genus *Glossina*, whereby it is at once distinguished from *Stomoxys*, to which it is nearly allied, consist in the dilatation of the extremity of the discoidal cell, the rounded horny bulbous base of the proboscis, which is not angulated at its base, and the long and slender flattened palpi, which together form a sheath protecting the proboscis. Wiedemann's typical species (which has remained unique to the present time), *Glossina longipalpis*, (subsequently described by Robineau Desvoidy under the name of *Nemorhina palpalis*,) is a native of Sierra Leone, where it was collected by Afzelius. M. Macquart, judging from the structure of the mouth, considers it probable that it does not live upon the blood of animals, like *Stomoxys*, but upon the nectar of flowers; the two setæ which are enclosed in the proboscis and compose the sucker being so slender, that it is difficult to conceive that they can pierce the skin, the palpi being also elongated so as to form a protection to it, and thus further indicating its weakness. There is however so great a difference between the structure of the proboscis in these insects and *Stomoxys*, that I do not doubt that they are able to pierce the skin of a horse, the proboscis of *Glossina* being a long, straight, horny, needle-like instrument, and not elbowed, with fleshy lips, as is that of *Stomoxys*. Moreover, the bulbous dilated base of the proboscis must evidently play an important part in the economy of the insect, either by giving additional support to the proboscis when in the act of piercing the skin, or by containing powerful muscles for the action of the enclosed setæ; or, as suggested to me by Prof. Owen, this dilated base may be analogous to the dilated base of the sting of the Scorpion, and like it contain a reservoir of some powerfully poisonous liquid.

The account of the irritating powers of the *Glossina* given by Captain Vardon is, it is true, not so detailed as could have been desired, but we learn sufficient to arrive at the conclusion that its effects are,

to a certain extent, exactly like those of the *Tabanidæ*; how far the attacks may be attended with tumours, similar to those produced by the *Simulium*, and whether a tropical climate may not extend the effects of the attack, producing inflammatory action upon animals perhaps never before in those latitudes, are questions which have yet to be answered. One thing however appears to me evident, that the Sêtsé is no other than the Zimb of Bruce, (an insect respecting whose real family and even existence so many doubts have been expressed,) or at least that that insect is a larger species of *Glossina*, to whose real habits Bruce has added those of a species of *Æstrus*. With the view of establishing this assertion, as well as of clearing up what I consider the inconsistencies of Bruce's account, I shall beg to introduce his description of the Zimb.

“Nothing was more opposite than the manners and life of the Cushite and of his carrier the shepherd. The mountains of the Cushite and the cities he built afterwards were situated upon a loamy black earth, so that, as soon as the tropical rains began to fall, a wonderful phenomenon deprived him of his cattle. Large swarms of flies appeared wherever that loamy earth was, which made him absolutely dependent in this respect upon the shepherd; but these affected the shepherd also. This insect is called the Zimb\* in modern or vulgar Arabic; it has not been described by any naturalist. It is in size very little larger than a bee, of a thicker proportion, and the wings, which are broader than those of a bee, are placed separate, like those of a fly. They are of pure gauze, without colour or spot upon them; the head is large; the upper jaw or lip is sharp, and has at the end of it a strong pointed hair of about a quarter of an inch long; the lower jaw has two of these pointed hairs, and this pencil of hairs, when joined together, makes a resistance to the finger nearly equal to that of a strong hog's bristle; its legs are serrated on the inside, and the whole covered with brown hair or down. As soon as this plague appears and its buzzing is heard, all the cattle forsake their food and run wildly about the plain till they die, worn out with fatigue, fright and hunger. No remedy remains but to leave the black earth and to hasten down to the plains of Atbara, and there they remain whilst the rains last, this cruel enemy never daring to pursue them farther.

“What enables the shepherd to perform the long and toilsome journeys across Africa is the camel, emphatically called by the Arabs the ship of the desert. Though his size is immense, like his strength, and his body covered with a thick skin defended with strong hair, yet still is he not capable to sustain the violent punctures the fly makes with his pointed proboscis. He must lose no time in removing to the sands of Atbara, for when once attacked by this fly, his body, head and legs swell out into large bosses, which break and putrefy to the certain destruction of the creature. Even the elephant and rhinoceros, who, by reason of their enormous bulk and the vast quantity of food and water they daily need, cannot shift to desert and dry places as the season may require, are obliged to roll themselves in

\* “ See Appendix. It is the same name as Zebul in Hebrew.—E.”

mud or mire, which when dry coats them over like armour, and enables them to stand their ground against this winged assassin; yet I have found some of these tubercles upon almost every elephant and rhinoceros that I have seen, and *attribute them to this cause*. All the inhabitants of the sea-coast of Melinda, down to Cape Gardéfán, Saba, and the south coast of the Red Sea, are obliged to put themselves in motion and change their habitation to the next sand in the beginning of the rainy season, to prevent all their stock of cattle from being destroyed.

“Of all those that have written upon these countries, the prophet Isaiah alone has given an account of this animal and the manner of its operation (Isaiah, vii. 18, 19): ‘And it shall come to pass in that day, that the Lord shall hiss for the fly that is in the uttermost part of the rivers of Egypt . . . and they shall come, and shall rest all of them in the desolate valleys, and in the holes of the rocks, and upon all thorns, and upon all bushes.’” (Travels, ii. pp. 314–317.)

“*Tsalsalya, or Fly*.—We are obliged with the greatest surprise to acknowledge that those huge animals, the elephant, the rhinoceros, the lion and the tiger, inhabiting the same woods, are still vastly this fly’s inferiors; and that the appearance of this small insect, nay, his very sound, though he is not seen, occasions more trepidation, movement and disorder, both in the human and brute creation, than whole herds of these monstrous animals collected together, though their number was in a tenfold proportion greater than it really is. Providence from the beginning it would seem had fixed its habitation to one species of soil, being a black fat earth, extraordinarily fruitful.

“We cannot read the history of the plagues which God brought upon Pharaoh by the hands of Moses, without stopping a moment to consider a singularity, a very principal one, which attended the plague of the fly. The land of Goshen, the possession of the Israelites, was a land of promise which was not tilled or sown, because it was not overflowed by the Nile. But the land overflowed by the Nile was the black earth of the Valley of Egypt, and it was here that God confined the flies.—I have magnified him about twice the natural size.—He has no sting, though he seems to me to be rather of the bee kind; but his motion is more rapid and sudden than that of the bee, and resembles that of the gad-fly in England. There is something particular in the sound or buzzing of this insect. It is a jarring noise, together with a humming, which induces me to believe that it proceeds, at least in part, from a vibration made with the three hairs at his snout.

“The Chaldee Version is content with calling this animal simply Zebub, which signifies the fly in general as we express it in English. The Arabs call it Arob in their translation, which has the same general signification. The Ethiopic translation calls it Tsal tsalya, which is the true name of this particular fly in Geez, and was the same in Hebrew. The Greeks have called this species of fly *Cynomyia*, which signifies the dog-fly; in imitation of which, those I suppose of the church of Alexandria that, after the coming of Frumentius, were correcting the Greek copy and making it conformable to the Septuagint,

have called this fly Tsal tsalya Kelb, in answer to the word Cynomyia. Salal in the Hebrew signifies 'to buzz' or 'to hum,' and as it were alludes to the noise with which the animal terrifies the cattle; and Tsal tsalya seems to come from this by only doubling the radicals: t'Tsalalou\*, in Amharic, signifies 'to pierce with violence.'"—*Appendix*, vii. 284 *et seq.*

From this account we learn that it is the sound of this insect which produces a great amount of trepidation in the cattle of Abyssinia. This accords with Bracy Clark's ideas of *Æstrus Bovis*. Bruce's description of the position of the wings clearly indicates a Dipterous insect, and his figure shows a bee-like insect, with a long straight porrected proboscis exactly like that of *Glossina*. Bruce adds, that the insect punctures the thick skin of the camel with its proboscis, the parts attacked breaking out into large bosses, which are also occasionally found upon the rhinoceros and elephant. It will be observed however that Bruce merely supposed these tumours to arise from the attack of the Zimb.

I think we have sufficient grounds for believing that Bruce has here jumbled together the notion of the buzzing of the *Æstrus* instilling dread into a herd of cattle, his knowledge of the piercing powers of the proboscis of the Sêtsé, and his knowledge of the tumours caused by the presence of the larvæ of *Æstri* under the skin of the camel †, rhinoceros and elephant. The College of Surgeons possesses a specimen of the larva of the *Æstrus* of the rhinoceros, and the camel is also subject to the attacks of a species of the same genus; whilst I consider that Bruce's figure is made up from memory, taking the statement of its resemblance to a bee and its possession of a proboscis together ‡. No instance, in fact, is known of a species which attacks these animals with its proboscis, forming tumours upon their backs such as are described by Bruce, which agree on the whole with the tumours caused by the larvæ of *Æstrus Bovis*; and we have already seen that no *Æstrus* is capable of inflicting a wound with the organs of the mouth, of which in fact all the known species are destitute, whilst the boring powers of their ovipositors are very questionable.

The accounts given by Mr. R. Gordon Cumming of the destructive powers of the Tsetse fully confirm the opinion here advanced, and prove that although "its bite is certain death to oxen and horses," it causes no dorsal tumours like an *Æstrus*. "This hunter's scourge," he says, "is similar to a fly in Scotland called *Kleg* §, but a little smaller; they are very quick and active, and storm a horse like a

\* "The name of this fly is undoubtedly derived from a word signifying 'to buzz' in Hebrew and Ethiopic.

† Pliny was aware of the attacks of *Æstri* upon the camel, and he informs us that the merchants of Arabia were in the habit of anointing their camels with whale- and fish-oils. (*Hist. Mund. lib. xxxii. p. 302, et lib. xi. cap. 16. p. 36. edit. Pancoucke.*)

‡ It is evident from the note added by the editor of the 8vo edition, from which the above extracts have been made, that the drawing of the insect was not a *bonâ fide* one made on the spot, but was manufactured at home.

§ *Kleg* is the local name for the *Hæmatopota pluvialis*.



swarm of bees, alighting on him in hundreds and drinking his blood. The animal thus bitten pines away and dies, at periods varying from a week to three months, according to the extent to which he has been bitten." "The next day one of my steeds died of the 'Tsetse.' The head and body of the poor animal swelled up in a most distressing manner before he died; his eyes were so swollen that he could not see, and in darkness he neighed for his comrades who stood feeding beside him\*."

The Marquis di Spineto, in a memoir published "On the Zimb of Bruce as connected with the Hieroglyphics of Egypt †," endeavoured to ascertain the characters of this insect, and came to the conclusion that it belongs to the order Diptera, notwithstanding Bruce says that it very much resembles the Bee genus, and that it has "several of the properties of the *Bombylius*, the *Tabanus*, the *Æstrus*, and the *Hippobosca*, without belonging to any of them. In some of its generic and even specific characters it is like the *Bombylius* and *Æstrus*, in others like the *Hippobosca* and the *Muscida*, in a few like the *Tabanus* and the Dog-fly, whilst in the aggregate it differs from every one of these insects." The Marquis points out the various relationships which the insect, as described by Bruce, presents to these different genera, considering that the porrected hairs or bristles forming the mouth "perform the office of suckers, simply because it does not lay its eggs in the flesh of animals; for according to the account which Bruce gives of the evils attending the attacks of this fly, the bosses which are produced swell, break and putrefy, but never exhibit any larvæ or maggots," thus differing from the habits of the *Æstri*; to which however he adds, by some curious misconception, that "the larvæ of the *Æstrus* live in wood, which does not seem to be the case with the Zimb."

The Marquis however identifies the Zimb with the *Κυνόμυια* or 'Dog-fly' of the Greeks, the 'Tsal tsalya Kelb' of the Alexandrian Church, the 'Af an ouhor' of the ancient Egyptians, the 'Arob' or 'Oreb' of Exodus viii. 21, and the 'Æstrus' of Aristotle; and considers that it is the precise species of fly which caused the fourth of the plagues of Egypt ‡. As such, he also regards it as the insect represented on the Egyptian monuments at the head of the cartouches which enclose the hieroglyphical titles of the Pharaohs, and as a symbol of Lower Egypt (where only the insect occurs), the preceding figure being intended for a sceptre, in contradiction to the opinion of M. Champollion, who regards the figure of the insect as that of a bee; and consequently the signification of the two symbols as that of "King of an obedient people." I can by no means however agree with this opinion of the Marquis Spineto, since an examination of various Egyptian monuments in the British Museum and elsewhere

\* Five Years of a Hunter's Life in the Far Interior of South Africa, ii. pp. 220, 227.

† Lond. and Edinb. Phil. Mag. 1834, vol. iv. p. 170.

‡ In the Article "Musquitoe" (Brit. Cyclop. Nat. Hist. iii. 299), I have suggested various reasons for supposing that the fourth plague of Egypt was caused by some species of *Culicida*, which, although not disproved, are certainly weakened by the knowledge now obtained of the real habits of the *Tsetse* or *Zimb*.

(in all of which the insect is represented under precisely the same form) has convinced me that it is intended to represent a Hymenopterous insect, and not one of the Diptera. It is in fact more like the figure of a common Wasp than any other ordinary insect; the appendages of the head, which are obliquely porrected, are evidently intended for antennæ, and not for a bipartite proboscis; the wings, it is true, are only represented as two in number, but as the two on each side of the body in the Hymenoptera are hooked together, they would, by common observers, be regarded as but one; while the contracted form of the base of the abdomen is precisely that of some of the *Vespidæ* figured in the great French work upon Egypt. The *Polistes* represented in pl. 8. fig. 2 ♂. of that work indeed might almost be considered as the identical species intended to be represented on the monuments.

Mr. S. Birch indeed informs me that there is a coloured representation of this hieroglyphic figure on one of the Egyptian monuments in the British Museum, and that the banded colours of the abdomen leave no doubt that it is intended for a Wasp. Moreover the Egyptian name of this insect was the same as that of Upper Egypt, whilst the preceding figure was intended for a reed as emblematical of Lower Egypt, and consequently the two figures indicated the power of the monarch over both these parts of the empire.

To render this article more complete, I have added descriptions of two more tropical African species of *Glossina*, from the Collection of the Rev. F. W. Hope, together with that of another remarkable hitherto undescribed genus allied to *Glossina*, but distinguished by the very singular recurved proboscis and long styliiferous abdomen, also from tropical Africa.

#### GLOSSINA TACHINOIDES, Westw.

*Cinerea, faciei striga longitudinali media fulva, epistomate ar-genteo-sericeo, thoracis dorso brunneo-maculato, scutello griseo maculis duabus brunneis punctisque duobus minutis apicalibus nigris, abdominis dorso carneo-griseo segmento singulo maculis duabus maximis fuscis, pedibus luteo-albidis, tarsis supra nigris.*

Long. corp. lin. 4; expans. alar. lin.  $8\frac{1}{2}$ .

*Hab.* in Africa occidentali tropicali. (Mus. D. Hope.)

This species is smaller than the preceding and differently coloured. The terminal joint of the antennæ is more lunate in form and dusky coloured in front; the palpi are dusky coloured at the tip and clothed with black hairs. The upper surface of the thorax is ash-coloured, divided across the middle by an impressed line; the anterior half is marked on each side towards the fore angles with an oval brown spot, extending laterally and backwards into a lunate line, enclosing a smaller oval spot on each side towards the hinder angles: in the middle are two slender abbreviated brown lines, and two minute spots resting upon the transverse impressed line over which they are extended and dilated into a pair of somewhat larger spots in the middle of the upper surface of the thorax, each with a slender transverse line

extending from it to the sides of the thorax, where it meets a curved lateral brown line enclosing a fainter oval spot, the hind extremity of each of which nearly joins, at the hinder angles of the back of the thorax, a straight line running forwards into the disk, where it vanishes. The upper side of the abdomen may be described as of a brown colour, with the lateral and posterior edges and an ill-defined longitudinal central band of fleshy ash: it is thickly clothed with minute black hairs on the disk, and with long ones at the base and sides. The wings and their veins are coloured as in *Gl. morsitans*.

GLOSSINA TABANIFORMIS, Westw.

*Griseo-fusca epistomate sericeo, thorace fusco-maculato, abdomine fusco-rufescenti apice sensim obfuscatō, pedibus fusco-luteis tibiis tarsisque nigro lineatis alis fusco infumatis.*

Long. corp. lin. 6; expans. alar. lin. 13½.

*Hab.* apud littus aureum Africæ tropicalis occidentalis. (Mus. D. Hope.)

This species is very much larger than either of the preceding. The head is comparatively much smaller and the wings much larger; the front of the head is dusky; it, as well as the basal joints of the antennæ, is rather thickly clothed with black hairs; the arista of the antennæ is luteous, with a dark line behind, and the branding setæ with which it is furnished are black; the palpi are thickly clothed externally with short black setæ; the thorax is dark greyish brown, also very thickly clothed with short black setæ and long curved lateral bristles; the back of the thorax is marked with a dark central longitudinal line, having a less distinct one on each side of it, between which and each side are two large brown spots, one behind the other; the scutellum is paler, and marked with two ill-defined dusky spots; the wings are stained brown; the legs are dirty luteous buff; the tibiæ marked with one, and the tarsi with three very delicate longitudinal black lines; the tibiæ are compressed, and the black line occupies the superior compressed ridge.

Tribe MYOPARIÆ, Macquart, Hist. Nat. Ins. Dipt. ii. 29.

Genus STYLOMYIA, Westw. (*Stylogaster*, Wlk. nec Macq.)

*Corpus subelongatum capite thorace parum latiori, facie antice dimidio supero carinato, dimidio infero valde concavo. Antennæ porrectæ articulo basali minimo, 2do obconico, 3tio sub-ovali præcedentis longitudine, vel præcedenti multo longiori compresso parum curvato, arista versus apicem marginis superi inserta, porrecta. Haustellum capite et thorace conjunctim triplo longius, porrectum, in medio geniculatum, dimidio basali parum deflexo et ad ejus apicem crassiori, dimidio apicali valde incurvato. Thorax brevis quadratus. Abdomen supra subconvexum parum curvatum, apice pone segmentum 5um in stylium elongatum (longitudine quinque articulorum præcedentium æqualem), deflexum valde angustum, contracto, hujus styli apice supero in uno sexu, oblique truncato; seta elongata supra hirsuta, lobo breviori compresso filamentisque duobus*

*elongatis simplicibus in cavitate truncata insidentibus. Alæ breves cellula 1ma postica clausa pediculata et postice dilatata, vena obliqua cellulam postice contiguam claudente subobsoleta; cellula anali brevissima vix pone pseudalulam extensa vena brevissima transversa clausa. Pedes elongati gracillimi, calcaribus duobus tibiæ parum elongatis, tibiis posticis difformibus, unguibus pulvillisque minutissimis.*

This genus is very close to the American genus *Stylogaster*, but especially differs from the description given thereof by M. Macquart, in the very minute condition of the anal cell of the wings. The form of the head and the unequal division of the haustellum, as represented in M. Macquart's pl. 13. fig. 15, are also characters at variance with those of the insects of which I have composed the present genus. The anal cell is of small size in *Stachynia*, Mcq. (*Dalmannia*, Rob. D.), but it is still more minute in *Stylomyia*. The long slender legs and minute claws and pulvilli are also unlike those of all the other *Myopariæ*.

#### STYLOMYIA LEONUM, Westw.

*Rufo-fulva, facie argenteo-sericea antennis rufo-fulvis arista nigra, vertice subplano macula ovali nigra ocellos postice includente, haustello nigro basi subtus parum pallidiori, thorace scutello abdomineque rufo-fulvis stylo concolori fascia lata fere apicali nigra, pedibus fulvis tarsis apice fuscis, tibiis duabus posticis dimidio basali fusco, apicali albido; tarsis nigris.*

Long. corp. lin., stylo excluso, 4; expans. alar. lin. 6.

*Hab.* in Sierra Leona, Africæ. (In Mus. D. Hope.)

The facets of the middle portion of the inner margin of the eyes are rather larger than the posterior ones. The wings are but slightly tinged with grey, and the veins are blackish. The extremity of the anal style with its filaments are fulvous coloured. The two posterior tibiæ are very slender at the base; the apical half is dilated on the upper edge, the under edge not being quite straight.—*Note.* All the details are taken from the species figured.

*STYLOMYIA CONFUSA, Westw. Fulva, facie argentea, vertice omnino nigro; antennis fulvis articulo 3tio antennarum longitudinem 2di vix superanti, ovali-conico, arista nigra; tuberculo antennifero pallide fulvo, haustello nigro basi fulvo; thorace supra nigro marginibus lateralibus angulisque anticis distincte et irregulariter luteis setis longis nigris. Scutello fusco setis duabus longis terminalibus nigris, pedibus quatuor anticis omnino luteo-albidis tibiis apice obscuris, femoribus duobus posticis fascia angusta ante alteraque pone medium fuscis; tibiis dimidio basali fusco fascia lata media alba, tertia parte apicali fusco, tarsis fuscis; abdomine fulvo segmentis 2do—5to margine postico tenui obscuro; styli dimidio basali fulvo-rufo; apicali nigro, genitalibus exertis fulvo-rufis; corpore subtus fulvo-albido. Præcedenti e tertia parte minor.*

*Hab.* —? (In Mus. Brit.)

Although in general form and proportion of its parts, especially of the terminal style of its abdomen, the specimen of this species in the British Museum agrees exactly with *St. Leonum*, yet the short third joint of the antennæ, and the extraordinarily enlarged size of the middle facets of the inner margin of the eyes, might indicate it to be the opposite sex of the preceding. The second segment of the abdomen is furnished on each side with a small fascicle of elongated black hairs.

This species is introduced by Mr. F. Walker into his 'List of the Dipterous Insects in the Collection of the British Museum' (part iii. p. 680), under the name of *Stylogaster stylatus*; but it appears to me that it neither accords with Macquart's generic characters of *Stylogaster*, nor with the concise Fabrician specific description of *Conops stylata* (Syst. Antl. 177), nor yet with Wiedemann's more detailed observations, especially with reference to the sexual difference in the form of the antennæ (Auss. Eur. Zw. Ins. ii. 245).

#### MISCELLANEOUS.

##### *Observations on the Circulation of the Blood in the Arachnida.*

By M. EMILE BLANCHARD.

UNTIL very lately the circulatory apparatus of the Arachnida remained nearly unknown. It was supposed, indeed, that the pulmonary Arachnida would resemble the Crustacea in their mode of circulation, whilst the tracheary Arachnida, on the other hand, would resemble insects; but observations on this subject are still almost entirely wanting, and all the peculiarities belonging to the type remained unknown. The question, however, made a great step, as far as regards the *Scorpionidæ*, in consequence of the researches of Mr. Newport; and in a memoir published three years since, I described the course of the principal arteries in the *Araneidæ*, in which they had not as yet been traced. Notwithstanding the appearance of these works, many points remained to be cleared up. A new examination of this circulatory apparatus has recently led me to ascertain its details in a tolerably complete manner. I had made my previous researches on species found in France, which are of very small size; but, during last autumn, a very lively specimen of a *Mygale* of the largest dimensions (*M. Blondii*), which inhabits South America, having been received at the museum, I have derived considerable assistance from it, in the investigation which I have long been pursuing, on the anatomy and physiology of the Arachnida. I injected this *Mygale*, introducing the injection by the heart, and succeeded by this means in following, and isolating by dissection, all the arteries distributed to every organ, even to their most delicate ramifications.

In this short abstract of my labours, I abstain from describing the course of these numerous arteries in detail, as the description will appear shortly in my work entitled 'L'Organisation du Règne Animal.' I content myself here with indicating the general result; a result which does not apply only to the species which has served me in a